

U.S. Patent Application
Serial No. 10/517,580

ATTACHMENT A

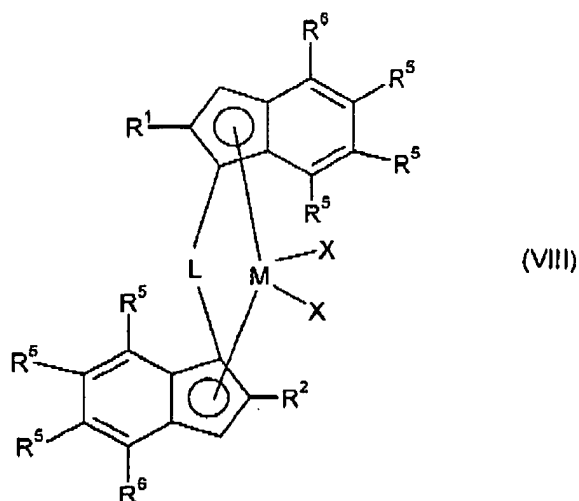
Amendments to the Claims

1. (Currently Amended) A propylene copolymer composition comprising:

- A) a propylene homopolymer; and
- B) at least one propylene copolymer containing from 12 to 18% by weight of at least one olefin other than propylene,

where the propylene homopolymer A and the propylene copolymer B are present as separate phases, the weight ratio of propylene homopolymer A to the propylene copolymer B is from 80:20 to 60:40 and the propylene copolymer composition has a haze value of $\leq 30\%$, based on a path length of the propylene copolymer composition of 1 mm, and the brittle/tough transition temperature of the propylene copolymer composition is $\leq -15^{\circ}\text{C}$, and the propylene copolymer composition is obtained from a multiphase polymerization process comprising a metallocene compound, wherein the metallocene compound is used in each polymerization phase and the metallocene compound is of formula (VIII):

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M is zirconium, hafnium or titanium;

X are identical or different and are each, independently of one another, hydrogen or halogen or an -R, -OR, -OSO₂CF₃, -OCOR, -SR, -NR₂ or -PR₂ group, where R is linear or branched C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl which may be substituted by one or more C₁-C₁₀-alkyl radicals, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl and optionally comprise at least one heteroatom of groups 13-17 of the Periodic Table of the Elements or one or more unsaturated bonds, where the two radicals X are optionally joined to one another and form a C₄-C₄₀-dienyl ligand, or an -OR'O-group in which R' is a divalent group selected from the group consisting of C₁-C₄₀-

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alkylidene, C₆-C₄₀-arylidene, C₇-C₄₀-alkylarylidene and C₇-C₄₀-arylalkylidene;

L is a divalent bridging group selected from the group consisting of C₁-C₂₀-alkylidene radicals, C₃-C₂₀-cycloalkylidene radicals, C₆-C₂₀-arylidene radicals, C₇-C₂₀-alkylarylidene radicals and C₇-C₂₀-arylalkylidene radicals, which may contain heteroatoms of groups 13-17 of the Periodic Table of the Elements, or a silylidene group having up to 5 silicon atoms;

R¹ is preferably unbranched in the α position and is a linear or branched C₁-C₁₀-alkyl group;

R² is a group of the formula -C(R³)₂R⁴;

R³ are identical or different and are each, independently of one another, linear or branched C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl optionally substituted by one or more C₁-C₁₀-alkyl radicals, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl and optionally comprises at least one heteroatom of groups 13-17 of the Periodic Table of the Elements or one or more unsaturated bonds, or two radicals R³ may be joined to form a saturated or unsaturated C₃-C₂₀-ring;

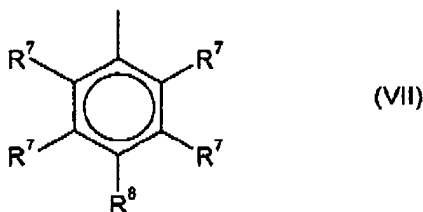
R⁴ is hydrogen or linear or branched C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl optionally substituted by one or more C₁-C₁₀-alkyl radicals, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-

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C₂₀-arylalkyl and optionally comprises at least one heteroatom of groups 13-17 of the Periodic Table of the Elements or one or more unsaturated bonds;

R⁵ are identical or different and are each, independently of one another, hydrogen or halogen or linear or branched C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl optionally substituted by at least one C₁-C₁₀-alkyl radicals, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl and optionally comprises at least one heteroatom of groups 13-17 of the Periodic Table of the Elements or one or more unsaturated bonds;

R⁶ is an aryl group of formula (VII):



R⁷ are identical or different and are each, independently of one another, hydrogen or halogen or linear or branched C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl optionally substituted by at least one C₁-C₁₀-alkyl radicals, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl and optionally comprises at least one heteroatom of groups

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13-17 of the Periodic Table of the Elements or one or more unsaturated bonds, or two radicals R⁷ are optionally joined to form a saturated or unsaturated C₃-C₂₀ ring; and

R⁸ is hydrogen or halogen or linear or branched C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl which is optionally substituted by at least one C₁-C₁₀-alkyl radicals, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl and optionally comprises at least one heteroatom of groups 13-17 of the Periodic Table of the Elements or one or more unsaturated bonds.

2. (Cancelled)

3. (Previously Presented) The propylene copolymer composition as claimed in claim 1, wherein the propylene homopolymer A has an isotactic structure.

4. (Previously Presented) The propylene copolymer composition as claimed in claim 1, wherein the olefin other than propylene in the propylene copolymer B) is ethylene.

5. (Previously Presented) The propylene copolymer composition as claimed in claim 1, wherein the value for

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stress whitening, determined by the dome method at 23°C, is from 0 to 8 mm.

6. (Cancelled)

7. (Previously Presented) The propylene copolymer composition as claimed in claim 1, wherein the copolymer B is dispersed in finely divided form in the matrix A.

8. (Cancelled)

9. (Previously Presented) The propylene copolymer composition as claimed in claim 1, comprising from 0.1 to 1% by weight, based on the total weight of the propylene copolymer composition, of a nucleating agent.

10. (Previously Presented) The propylene copolymer composition as claimed in claim 1, wherein a glass transition temperature of the propylene copolymer B determined by means of DMTA (dynamic mechanical thermal analysis) is in the range from -20°C to -40°C.

11. (Previously Presented) The propylene copolymer composition as claimed in claim 1, wherein a ratio of the

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shear viscosity of propylene copolymer B to that of propylene homopolymer A at a shear rate of 100 s^{-1} is in the range from 0.3 to 2.5.

12. (Previously Presented) The propylene copolymer composition as claimed in claim 1, wherein a molar mass distribution M_w/M_n is in the range from 1.5 to 3.5.

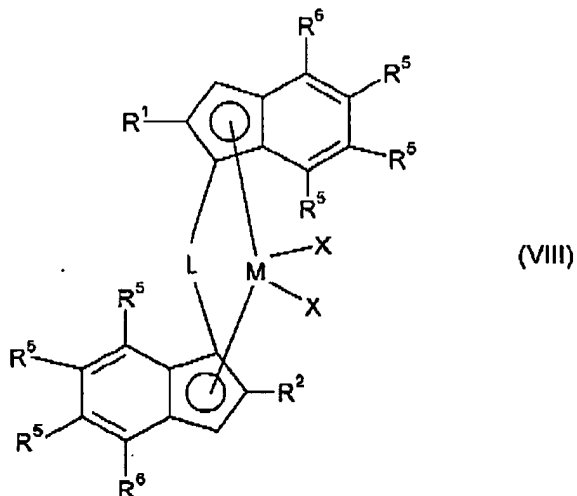
13. (Currently Amended) A process for preparing a propylene copolymer composition comprising:

- A) a propylene homopolymer; and
- B) at least one propylene copolymer containing from 12 to 18% by weight of at least one olefin other than propylene,

where the propylene homopolymer A and the propylene copolymer B are present as separate phases, the weight ratio of propylene homopolymer A to the propylene copolymer B is from 80:20 to 60:40 and the propylene copolymer composition has a haze value of $\leq 30\%$, based on a path length of the propylene copolymer composition of 1 mm, and the brittle/tough transition temperature of the propylene copolymer composition is $\leq -15^\circ\text{C}$;

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the process comprising polymerizing monomers in a multistage polymerization with a catalyst system based on metallocene compounds and the metallocene compound is of formula (VIII):



M is zirconium, hafnium or titanium;
X are identical or different and are each, independently of one another, hydrogen or halogen or an -R, -OR, -OSO₂CF₃, -OCOR, -SR, -NR₂ or -PR₂ group, where R is linear or branched C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl which may be substituted by one or more C₁-C₁₀-alkyl radicals, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl and optionally comprise at least one heteroatom of groups 13-17 of the Periodic Table of the Elements or one or more unsaturated bonds, where

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the two radicals X are optionally joined to one another and form a C₄-C₄₀-dienyl ligand, or an -OR'O-group in which R' is a divalent group selected from the group consisting of C₁-C₄₀-alkylidene, C₆-C₄₀-arylidene, C₇-C₄₀-alkylarylidene and C₇-C₄₀-arylalkylidene;

L is a divalent bridging group selected from the group consisting of C₁-C₂₀-alkylidene radicals, C₃-C₂₀-cycloalkylidene radicals, C₆-C₂₀-arylidene radicals, C₇-C₂₀-alkylarylidene radicals and C₇-C₂₀-arylalkylidene radicals, which may contain heteroatoms of groups 13-17 of the Periodic Table of the Elements, or a silylidene group having up to 5 silicon atoms;

R¹ is preferably unbranched in the α position and is a linear or branched C₁-C₁₀-alkyl group;

R² is a group of the formula -C(R³)₂R⁴;

R³ are identical or different and are each, independently of one another, linear or branched C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl optionally substituted by one or more C₁-C₁₀-alkyl radicals, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl and optionally comprises at least one heteroatom of groups 13-17 of the Periodic Table of the Elements or one or more

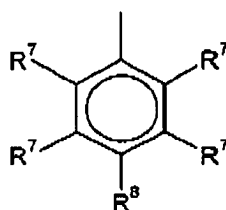
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unsaturated bonds, or two radicals R^3 may be joined to form a saturated or unsaturated C_3 - C_{20} -ring;

R^4 is hydrogen or linear or branched C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl optionally substituted by one or more C_1 - C_{10} -alkyl radicals, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl or C_7 - C_{20} -arylalkyl and optionally comprises at least one heteroatom of groups 13-17 of the Periodic Table of the Elements or one or more unsaturated bonds;

R^5 are identical or different and are each, independently of one another, hydrogen or halogen or linear or branched C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl optionally substituted by at least one C_1 - C_{10} -alkyl radicals, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl or C_7 - C_{20} -arylalkyl and optionally comprises at least one heteroatom of groups 13-17 of the Periodic Table of the Elements or one or more unsaturated bonds;

R^6 is an aryl group of formula (VII):



(VII)

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R⁷ are identical or different and are each, independently of one another, hydrogen or halogen or linear or branched C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl optionally substituted by at least one C₁-C₁₀-alkyl radicals, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl and optionally comprises at least one heteroatom of groups 13-17 of the Periodic Table of the Elements or one or more unsaturated bonds, or two radicals R⁷ are optionally joined to form a saturated or unsaturated C₃-C₂₀ ring; and

R⁸ is hydrogen or halogen or linear or branched C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl which is optionally substituted by at least one C₁-C₁₀-alkyl radicals, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl and optionally comprises at least one heteroatom of groups 13-17 of the Periodic Table of the Elements or one or more unsaturated bonds.

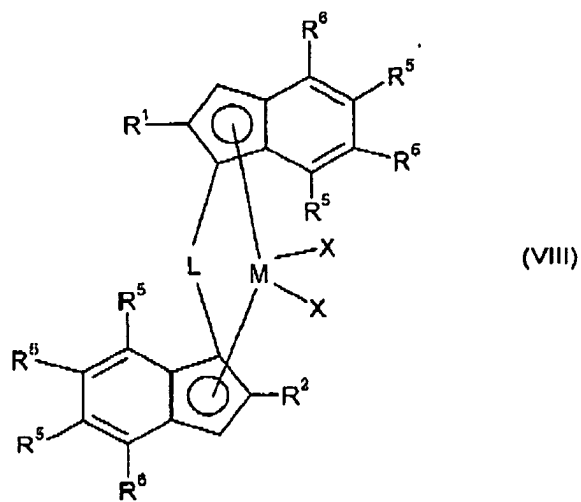
14. (Currently Amended) A process comprising producing a fiber, film or molding from a propylene copolymer composition, the process comprising extruding or injection-molding the propylene copolymer composition, the propylene copolymer composition comprising

A) a propylene homopolymer; and

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B) at least one propylene copolymer containing from 12 to 18% by weight of at least one olefin other than propylene,

where the propylene homopolymer A and the propylene copolymer B are present as separate phases, the weight ratio of propylene homopolymer A to the propylene copolymer B is from 80:20 to 60:40 and the propylene copolymer composition has a haze value of $\leq 30\%$, based on a path length of the propylene copolymer composition of 1 mm, and the brittle/tough transition temperature of the propylene copolymer composition is $\leq -15^{\circ}\text{C}$, and the propylene copolymer composition is obtained from a multiphase polymerization process comprising a metallocene compound, wherein the metallocene compound is used in each polymerization phase and the metallocene compound is of formula (VIII):



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- M is zirconium, hafnium or titanium;
- X are identical or different and are each, independently of one another, hydrogen or halogen or an -R, -OR, -OSO₂CF₃, -OCOR, -SR, -NR₂ or -PR₂ group, where R is linear or branched C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl which may be substituted by one or more C₁-C₁₀-alkyl radicals, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl and optionally comprise at least one heteroatom of groups 13-17 of the Periodic Table of the Elements or one or more unsaturated bonds, where the two radicals X are optionally joined to one another and form a C₄-C₄₀-dienyl ligand, or an -OR'O-group in which R' is a divalent group selected from the group consisting of C₁-C₄₀-alkylidene, C₆-C₄₀-arylidene, C₇-C₄₀-alkylarylidene and C₇-C₄₀-arylalkylidene;
- L is a divalent bridging group selected from the group consisting of C₁-C₂₀-alkylidene radicals, C₃-C₂₀-cycloalkylidene radicals, C₆-C₂₀-arylidene radicals, C₇-C₂₀-alkylarylidene radicals and C₇-C₂₀-arylalkylidene radicals, which may contain heteroatoms of groups 13-

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17 of the Periodic Table of the Elements, or a silylidene group having up to 5 silicon atoms;

R¹ is preferably unbranched in the α position and is a linear or branched C₁-C₁₀-alkyl group;

R² is a group of the formula -C(R³)₂R⁴;

R³ are identical or different and are each, independently of one another, linear or branched C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl optionally substituted by one or more C₁-C₁₀-alkyl radicals, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl and optionally comprises at least one heteroatom of groups 13-17 of the Periodic Table of the Elements or one or more unsaturated bonds, or two radicals R³ may be joined to form a saturated or unsaturated C₃-C₂₀-ring;

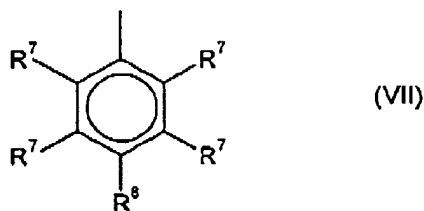
R⁴ is hydrogen or linear or branched C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl optionally substituted by one or more C₁-C₁₀-alkyl radicals, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl and optionally comprises at least one heteroatom of groups 13-17 of the Periodic Table of the Elements or one or more unsaturated bonds;

R⁵ are identical or different and are each, independently of one another, hydrogen or halogen or linear or branched C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl optionally

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substituted by at least one C₁-C₁₀-alkyl radicals, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl and optionally comprises at least one heteroatom of groups 13-17 of the Periodic Table of the Elements or one or more unsaturated bonds;

R⁶ is an aryl group of formula (VII):



R⁷ are identical or different and are each, independently of one another, hydrogen or halogen or linear or branched C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl optionally substituted by at least one C₁-C₁₀-alkyl radicals, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl and optionally comprises at least one heteroatom of groups 13-17 of the Periodic Table of the Elements or one or more unsaturated bonds, or two radicals R⁷ are optionally joined to form a saturated or unsaturated C₃-C₂₀ ring; and

R⁸ is hydrogen or halogen or linear or branched C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl which is optionally substituted by at least one C₁-C₁₀-alkyl radicals, C₆-

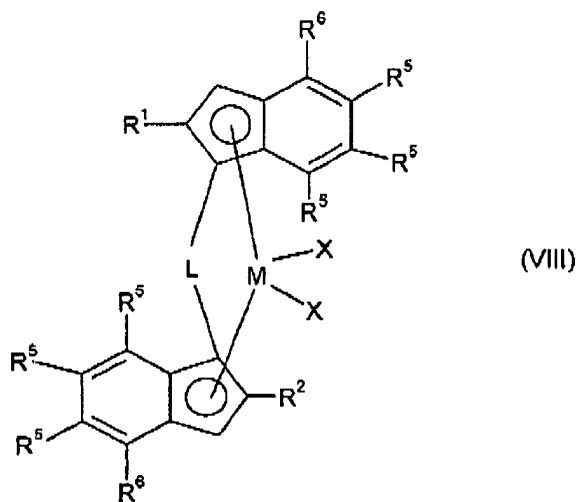
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C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl and optionally comprises at least one heteroatom of groups 13-17 of the Periodic Table of the Elements or one or more unsaturated bonds.

15. (Currently Amended) A fiber, film or molding comprising a propylene copolymer composition comprising:

- A) a propylene homopolymer; and
 - B) at least one propylene copolymer containing from 12 to 18% by weight of at least one olefin other than propylene,
- where the propylene homopolymer A and the propylene copolymer B are present as separate phases, the weight ratio of propylene homopolymer A to the propylene copolymer B is from 80:20 to 60:40 and the propylene copolymer composition has a haze value of $\leq 30\%$, based on a path length of the propylene copolymer composition of 1 mm, and the brittle/tough transition temperature of the propylene copolymer composition is $\leq -15^{\circ}\text{C}$, and the propylene copolymer composition is obtained from a multiphase polymerization process comprising a metallocene compound, wherein the metallocene compound is used in each polymerization phase and the metallocene compound is of formula (VIII):

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M is zirconium, hafnium or titanium;

X are identical or different and are each, independently of one another, hydrogen or halogen or an -R, -OR, -OSO₂CF₃, -OCOR, -SR, -NR₂ or -PR₂ group, where R is linear or branched C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl which may be substituted by one or more C₁-C₁₀-alkyl radicals, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl and optionally comprise at least one heteroatom of groups 13-17 of the Periodic Table of the Elements or one or more unsaturated bonds, where the two radicals X are optionally joined to one another and form a C₄-C₄₀-dienyl ligand, or an -OR'O-group in which R' is a divalent group selected from the group consisting of C₁-C₄₀-

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alkylidene, C₆-C₄₀-arylidene, C₇-C₄₀-alkylarylidene and C₇-C₄₀-arylalkylidene;

L is a divalent bridging group selected from the group consisting of C₁-C₂₀-alkylidene radicals, C₃-C₂₀-cycloalkylidene radicals, C₆-C₂₀-arylidene radicals, C₇-C₂₀-alkylarylidene radicals and C₇-C₂₀-arylalkylidene radicals, which may contain heteroatoms of groups 13-17 of the Periodic Table of the Elements, or a silylidene group having up to 5 silicon atoms;

R¹ is preferably unbranched in the α position and is a linear or branched C₁-C₁₀-alkyl group;

R² is a group of the formula -C(R³)₂R⁴;

R³ are identical or different and are each, independently of one another, linear or branched C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl optionally substituted by one or more C₁-C₁₀-alkyl radicals, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl and optionally comprises at least one heteroatom of groups 13-17 of the Periodic Table of the Elements or one or more unsaturated bonds, or two radicals R³ may be joined to form a saturated or unsaturated C₃-C₂₀-ring;

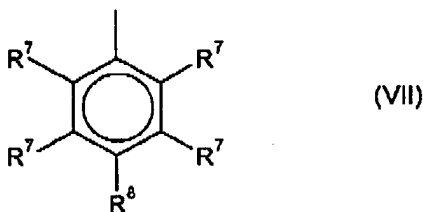
R⁴ is hydrogen or linear or branched C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl optionally substituted by one or more C₁-C₁₀-alkyl radicals, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-

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C₂₀-arylalkyl and optionally comprises at least one heteroatom of groups 13-17 of the Periodic Table of the Elements or one or more unsaturated bonds;

R⁵ are identical or different and are each, independently of one another, hydrogen or halogen or linear or branched C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl optionally substituted by at least one C₁-C₁₀-alkyl radicals, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl and optionally comprises at least one heteroatom of groups 13-17 of the Periodic Table of the Elements or one or more unsaturated bonds;

R⁶ is an aryl group of formula (VII):



R⁷ are identical or different and are each, independently of one another, hydrogen or halogen or linear or branched C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl optionally substituted by at least one C₁-C₁₀-alkyl radicals, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl and optionally comprises at least one heteroatom of groups

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13-17 of the Periodic Table of the Elements or one or more unsaturated bonds, or two radicals R⁷ are optionally joined to form a saturated or unsaturated C₃-C₂₀ ring; and

R⁸ is hydrogen or halogen or linear or branched C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl which is optionally substituted by at least one C₁-C₁₀-alkyl radicals, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl and optionally comprises at least one heteroatom of groups 13-17 of the Periodic Table of the Elements or one or more unsaturated bonds.

16. (Cancelled)

17. (Cancelled)

18. (Cancelled)